

Attitude Change in Programed Instruction Related to Achievement and Performance

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As a research study¹ involving several methods of utilizing a programed course progressed, it was noted that the subjects were exhibiting great enthusiasm for this method of instruction. The researchers began to speculate about whether or not this enthusiasm would be sustained throughout the school year, and, if it changed, what effects the change would have on learning and performance (operationally defined as the learner's frame by frame responses).

PROBLEM The problem was generally stated as: *What is the effect of attitude change in programed instruction on achievement and performance?* It was pursued, however, in terms of the following subproblems:

1. Is there a change in learner attitude toward programed instruction as a result of its prolonged (year-long) use?
2. What is the effect of attitude change on subject-matter achievement?
3. What is the effect of attitude change on performance?

¹ Woodruff, A. B.; Shimabukuro, S.; and Frey, S. *Methods of Programed Instruction Related to Student Characteristics*. Cooperative Research Project No. 2284. Washington, D.C.: U.S. Office of Education, Department of Health, Education, and Welfare, 1965.

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PROCEDURE The subjects consisted of 74 eighth graders enrolled in a general science course. They were divided into four class groups, but all were taught by the same teacher. For all subjects, this was the first experience with programed instruction.

Subjects

The methods of utilizing the programed material were varied along two dimensions: (1) in-class or out-of-class use of the programs; and (2) teacher or student regulated scheduling of rate of progress through the programs, discussions, and tests. To wit, Group I used the programed materials during the regularly scheduled class period at their own rate of progress; Group II used the material during the regularly scheduled class period, with the teacher regulating student rate of progress; Group III worked on the programed material on an out-of-class basis with the students progressing at their individual rates; and the programed material for Group IV was assigned on an out-of-class basis with teacher determination of rate of progress. Opportunities were provided for conferences with the teacher in each group on either a formal or informal basis, depending upon student need and/or student performance on tests. These could be individual or group conferences, teacher or pupil initiated. This general pattern of utilization was adhered to throughout the year. The experiment was incorporated into the ongoing activities of the cooperating public school; that is, its conditions did not take precedence over nor did they obviate the usual curricular or extracurricular activities of the participating students.

The Programed Course

The programed instruction utilized in this study was TMI-Grolier's course TM-404. It was a complete course in general science. It was a linear program mainly of the constructed response type with a few frames requiring multiple-choice responses.

Data Gathered

Three measures were employed in this study: (a) achievement, (b) performance, and (c) attitude.

a. *Achievement Measures.* Three measures of achievement were taken paralleling three administrations of a comprehensive objective examination over the content of the programed course. A pretest was given at the beginning of the school year before any work on the programed course had begun. The first posttest was given at the end of the first semester after about one-half of the programed course was completed. The second posttest was given at the end of the school year when the entire programed course had been completed.

First semester achievement. First semester achievement was

computed as the difference between the pretest and the first posttest (end of first semester).

Second semester achievement. Second semester achievement was computed as the difference between the first posttest and the second posttest (end of school year).

Total year achievement. Total year achievement was computed as the difference between the pretest and the second posttest.

b. *Performance Measures.* In order to get a measure of performance, the frame-to-frame responses of students were examined to determine if there were any differences in student response as they progressed through the program. Each frame was scored either "correct," "incorrect," or "blank." In the analysis of the performance data, however, only the correctly answered frames for each subject were used. The "incorrect" and "blank" frames gave no more information than just the number correct.

First semester performance. First semester performance was computed as the mean number correct out of a total of 3,583 frames.

Second semester performance. Second semester performance was computed as the mean number correct out of a total of 3,469 frames.

Total year performance. Total year performance was computed as the mean number correct out of a total of 7,502 frames.

c. *Attitude Measures.* The instrument developed covered attitudes involved in the student's reaction to programed instruction *per se*; to characteristics of the programed text; to programed instruction compared to teacher explanation; and to programed texts compared to regular textbooks. It was constructed so that there were 25 pairs of items—one member of each pair was a positive attitude statement and the other member was a negative statement covering the same attitude. The statements were randomly listed, but two members of one pair were never presented together. Although it was recognized that the instrument would have to be accepted on the basis of concept and face validity, a split-half technique, using the members of the pairs of items, gave a reliability coefficient of .97. The subjects responded anonymously on a five-point scale to the statements on this instrument at the end of the first semester of use of the programed course, and again at the end of the second semester. In analyzing the results of the questionnaire, each response to an item was assigned a number, depending on

whether it was a positive or negative statement. The responses were coded 1 to 5, with a "strongly agree" to a positive statement being assigned a 5, and to a negative statement, a 1. These numbers were summated for the score of each subject.

RESULTS The results of the study are reported in terms of the subproblems stated earlier.

1. *Is there a change in learner attitude toward programed instruction as a result of its prolonged (year-long) use?*

Table 1 shows that the total group dropped in its attitude toward programed instruction during the second semester and that this drop was statistically significant. The mean attitude at the end of the first semester was 168.51, and at the end of the second semester, it was 155.13. The resulting t-score for the differences between means was significant at the .01 level of confidence. An analysis of individual group means showed the differences to be statistically significant for all except Group IV which also showed a drop in mean attitude score.

TABLE 1
Attitude Measures
(N = 74)

	<i>Time of Administration</i>	
	<i>End of First Semester</i>	<i>End of Second Semester</i>
Mean	168.51	155.13
Standard Deviation	24.53	28.20
t	6.1362*	

* $p < .01$.

2. *What is the effect of attitude change on subject-matter achievement?*

As Table 2 indicates, there was a marked decline in achievement during the second semester as compared to first semester achievement. The mean achievement for the year was 33.99. Of this, 25.48 was the mean gain for the first semester, and only 8.51 the mean gain for the second semester. There were no significant differences among the four treatment groups in terms of achievement over the content of the programed course. There was, then, a drop in achievement during the second semester of work on the programed course which corresponded with the negative change in attitude during the same period.

TABLE 2
Achievement Measures
(N = 74)

	<i>First Semester</i>	<i>Second Semester</i>	<i>Year</i>
Mean	25.48	8.51	33.99
Standard Deviation	13.56	10.77	17.62
Span of Scores	-1—+65	-26—+32	-3—+82

Coefficients of correlation were computed between attitude change and achievement. Nonsignificant negative correlations were obtained for both the second semester and year achievement measures.

3. *What is the effect of attitude change on performance?*

In contrast to achievement, the performance measure for the first and second semesters remained constant. Table 3 shows that the total number of correct frames for the entire program was almost evenly divided between the first and second semester's work on the program. There was no rise in error rate to coincide with the drop in favorable attitude toward the programed instruction. As in the case of achievement, there were no significant differences among the four groups as far as their performances were concerned.

TABLE 3
Performance
Scores—Number
Correct Frames
(N = 74)

	First Semester	Second Semester	Year
Mean	3,256.23	3,245.44	6,501.67
Standard Deviation	283.03	227.22	456.56
Span of Scores	2,074—3,556	2,733—3,466	4,691—7,006

Likewise, the coefficients of correlation between performance and attitude change were nonsignificant. The number of frames to which were given correct responses was not affected by changes in attitude toward programed instruction.

DISCUSSION

This study was an outgrowth of a larger study involving several different methods of utilizing programed instruction. It is unfortunate that it was not possible to take a measure of the apparent enthusiasm for this new method of instruction as the study got underway. The results of the attitude measure taken at the end of the first semester, however, tend to indicate that the attitude toward programed instruction remained decidedly favorable throughout the first half of the school year. This is also confirmed by the observations of the researchers and the teacher.

The mean achievement of 25.48 for the first semester is regarded as high, especially when it is compared to the second semester mean achievement of only 8.51. Conversely, it was observed that there was a statistically significant change in attitude in the negative direction during the second semester, and this was accompanied by a considerable drop in achievement.

It appears that when learners were taken as a group, there was a positive relationship between attitude toward programed

instruction and subject-matter achievement; i.e., a reduction in mean attitude score was accompanied by a reduction in mean achievement score. However, when individual scores of attitude change were correlated with individual achievement scores, no significant coefficients were obtained. There was, then, a general reduction in achievement which accompanied a general reduction in favorable attitude, but the individuals with the largest loss in attitude scores did not necessarily have the greatest loss in achievement scores.

The fact that the negative attitude change and reduced achievement were not accompanied by an increase in error rate as the learners worked through the program has some significant implications. For one thing, it means that the mere fact that learners are given correct answers to frames does not mean that they are learning. Something more than reinforcement (knowledge of results) is required for learning to occur. For another, learners may be supervised or monitored to work efficiently on programs (gave low error rates), but this does not necessarily insure efficient learning.

Lack of variety of style in programing (i.e., redundant patterns of presentation) in the program used may or may not have been a significant factor in the attitudinal changes noted in this study. It was not investigated. One cannot deny the possibility of such an effect, yet it would seem more plausible in this case that length and intensity of use would be the more critical factors. It was found in this study that negative attitude change toward programed instruction accompanied a marked decline in achievement, with student performance in terms of error rate remaining relatively constant. This finding leads the researchers to make the following conclusions:

CONCLUSIONS

1. The continued intensive use of programed materials over an extended period of time without relief through other modes of instruction is not recommended. While unique, this approach to instruction has its saturation point insofar as student use is concerned, just as do the more traditional approaches. To paraphrase a little—variety is the spice of instruction. Teacher involvement in the instructional situation, therefore, remains the crucial element. The importance of the role that the teacher plays in the classroom where programed materials are being used extensively is, in fact, enhanced by the finding of this study. She must be there to govern the use of these materials

by individual students in such ways as to maintain student interest in the subject matter of the course. She can best achieve this by introducing other appropriate methods of instruction (e.g., class discussion, films, small group projects, etc.) in either a primary or supplementary way periodically throughout the course of the school year.

2. The administrator as supervisor of instruction has a special mandate to encourage teachers who are using programed materials extensively in their classes to vary their instructional procedures quite frequently. One very effective way of doing this is to supply teachers with the time, equipment, and material with which to do this. Another is to encourage them to enroll in courses in programed instruction so that they may learn its limitations and most effective uses. It should be noted in this respect that to the extent that this study is generalizable to other programed courses being used, the use of teachers simply as monitoring agents in classrooms using programed instruction is a waste of staff resources.

3. The problem of motivation for classroom learning is perhaps the most persistent problem of formal education, and programed instruction by no means offers an easy solution to it. Especially is this true where learners are subjected to a daily diet of programed instruction for the duration of a school year. There is a tendency for learners to lose interest, and for the program to eventually diminish in effectiveness.

On the other hand, this is not unusual. It happens whenever there is intensive use of *one* method of instruction over an extensive period. This is no more true for programed instruction than for films, lectures, television, textbooks, and workbooks. As with any of these materials, programed instruction requires the careful management and enrichment of classroom experience by the teacher in order to sustain its effectiveness over the long haul.

(*Editor's note:* In addition, consideration must be given to the fact that an attitude toward *one* specific program may not necessarily be a student's attitude toward *all* programed texts. An opportunity for the student to use numerous programs incorporating various styles and presentation formats should be provided in any continuing assessment.)